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Fraser

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(54) **METHODS AND APPARATUS FOR ASSEMBLING A WHEEL CHAIR**

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A47C 7/00 (2006.01)

(52) **U.S. Cl.** **297/440.2**; 297/DIG. 4

(58) **Field of Classification Search** ..... 297/440.2, 297/DIG. 2, 440.21, DIG. 4
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,684,149	A		8/1987	Meyer
4,736,960	A		4/1988	Batty et al.
4,809,998	A		3/1989	Girvin
4,966,379	A		10/1990	Mulholland
5,020,816	A		6/1991	Mulholland
5,062,677	A		11/1991	Jay et al.
5,127,709	A		7/1992	Rubinstein et al.
5,188,383	A		2/1993	Thompson
5,244,222	A		9/1993	Benoit
5,301,970	A		4/1994	Haskins
5,364,162	A	*	11/1994	Bar et al. 297/284.8
5,556,168	A	*	9/1996	Dinsmoor et al. 297/440.2
5,727,809	A		3/1998	Ordelman et al.
5,758,897	A		6/1998	Kueschall
5,947,562	A	*	9/1999	Christofferson et al. 297/440.22
6,073,958	A		6/2000	Gagnon
6,257,664	B1	*	7/2001	Chew et al. 297/284.9
6,257,665	B1	*	7/2001	Nagamitsu et al. 297/285
6,460,927	B1	*	10/2002	Groth 297/284.9
6,460,933	B1	*	10/2002	Bors et al. 297/440.2
6,688,693	B2	*	2/2004	Christofferson et al. 297/354.12
6,709,060	B1	*	3/2004	Su 297/440.2
2003/0189306	A1		10/2003	Chen et al.
2004/0066081	A1		4/2004	Dennon et al.

* cited by examiner

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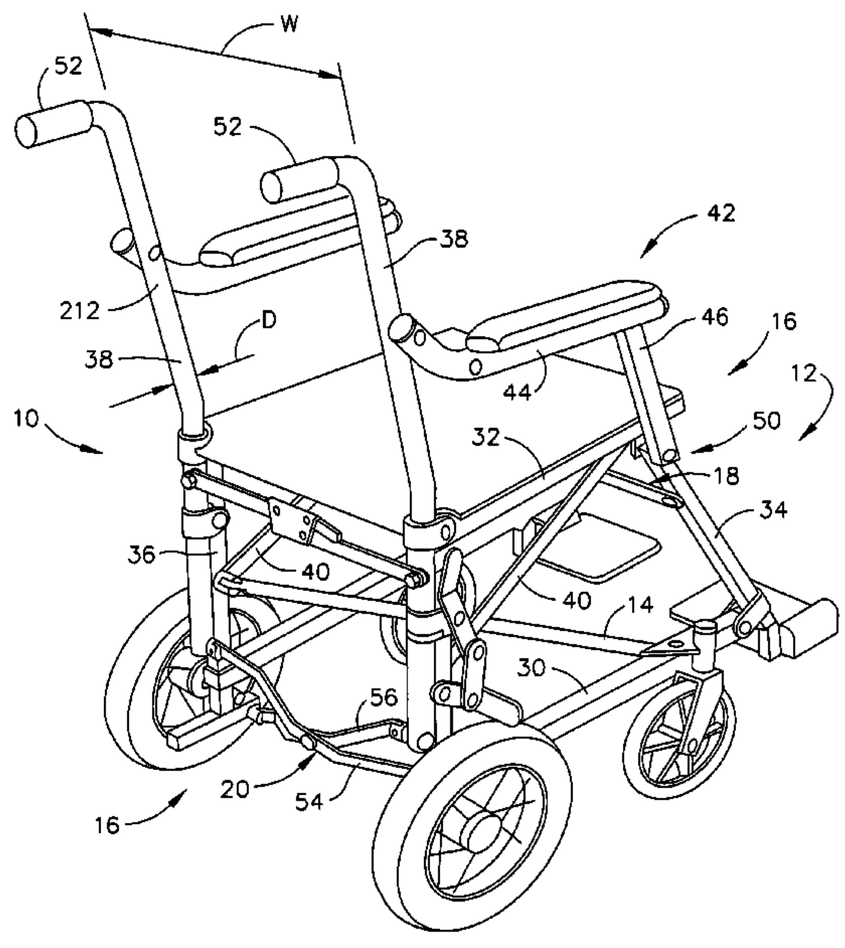
(57) **ABSTRACT**

A wheelchair back assembly mounts to a pair of spaced apart laterally-aligned support posts of a wheelchair back frame. The back assembly includes a relatively rigid shell member, and a mounting system for coupling the shell member to the wheelchair back frame. The mounting system includes at least a first mounting bracket assembly, a second mounting bracket assembly, and a lateral member that is configured to be coupled to the first and second mounting bracket assemblies. The first mounting bracket assembly is configured to couple to a first of the wheelchair back frame support posts, and the second mounting bracket assembly is configured to couple to the second of the wheelchair back frame support posts. The lateral member is selectively operable to uncouple the shell member from the wheelchair back frame.

39 Claims, 8 Drawing Sheets



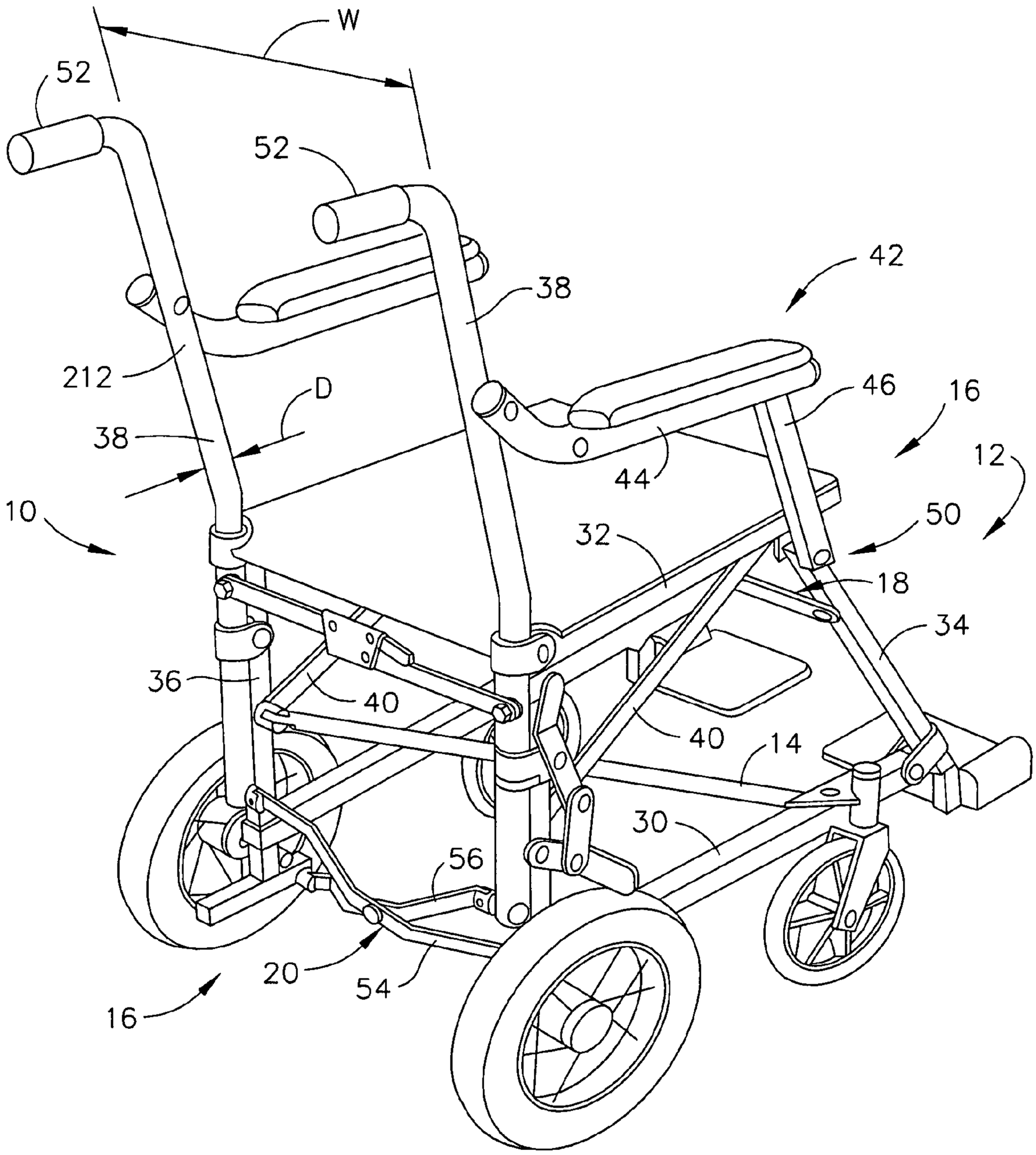

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FIG. 1

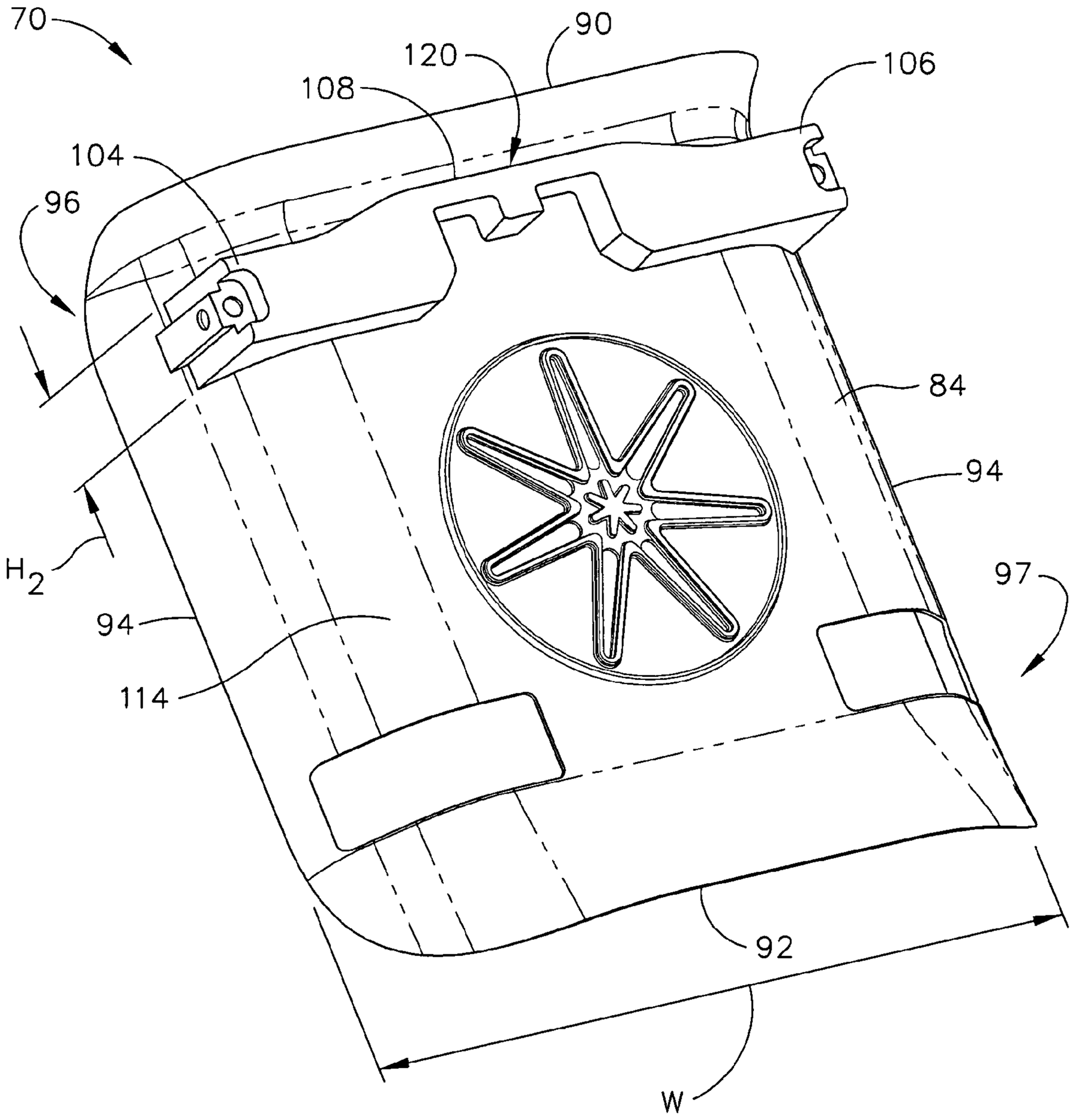

FIG. 2

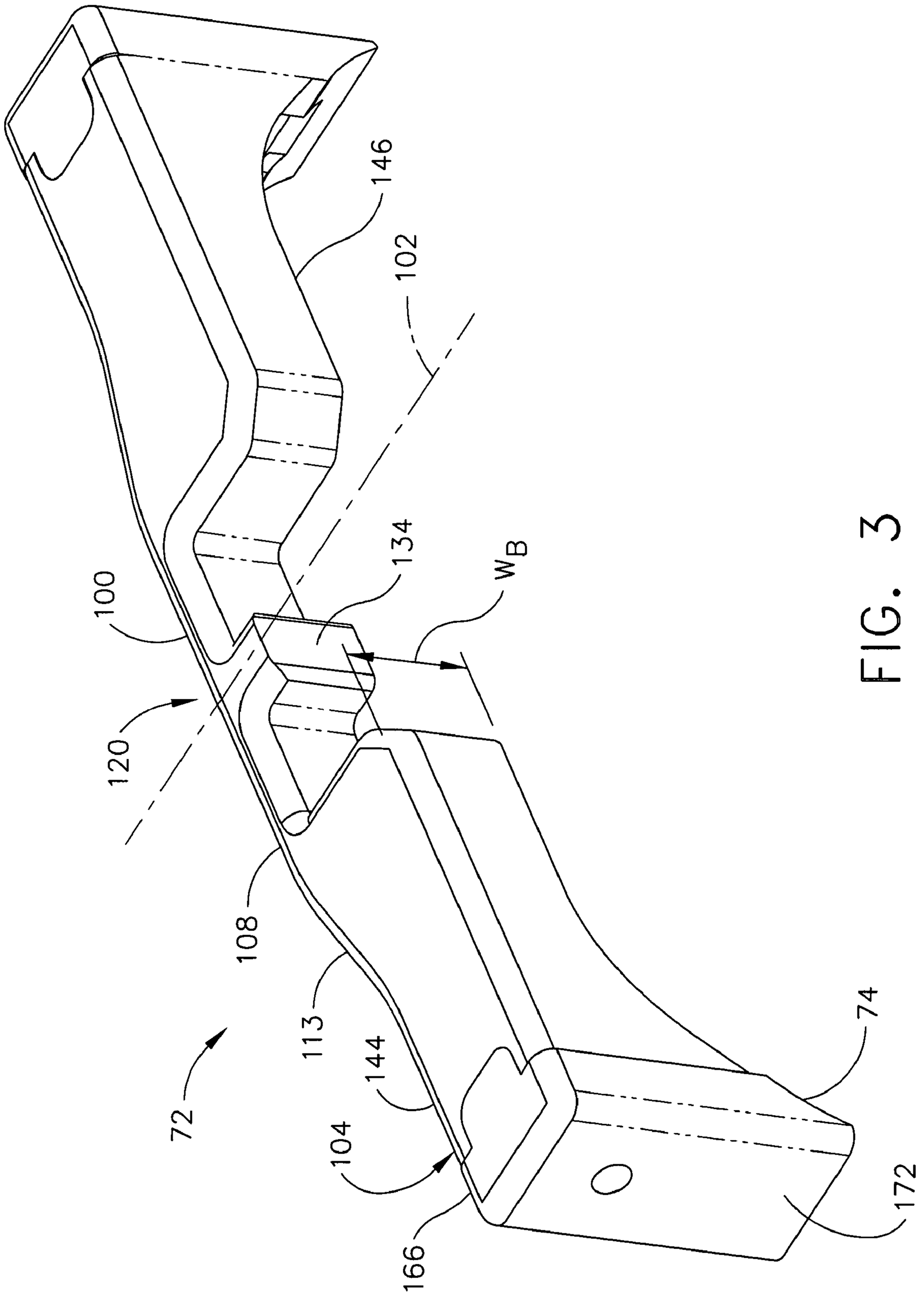

FIG. 3

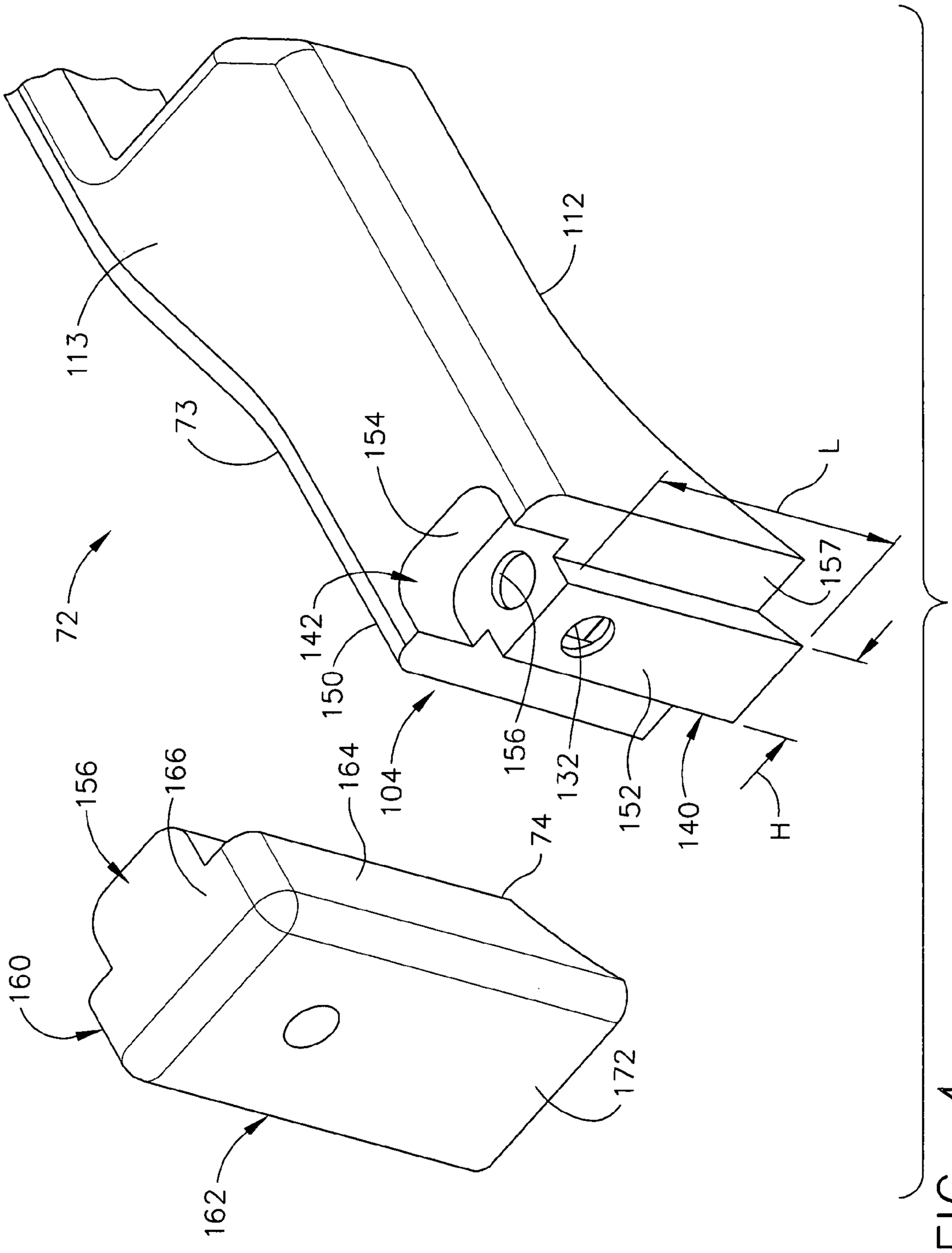
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FIG. 4

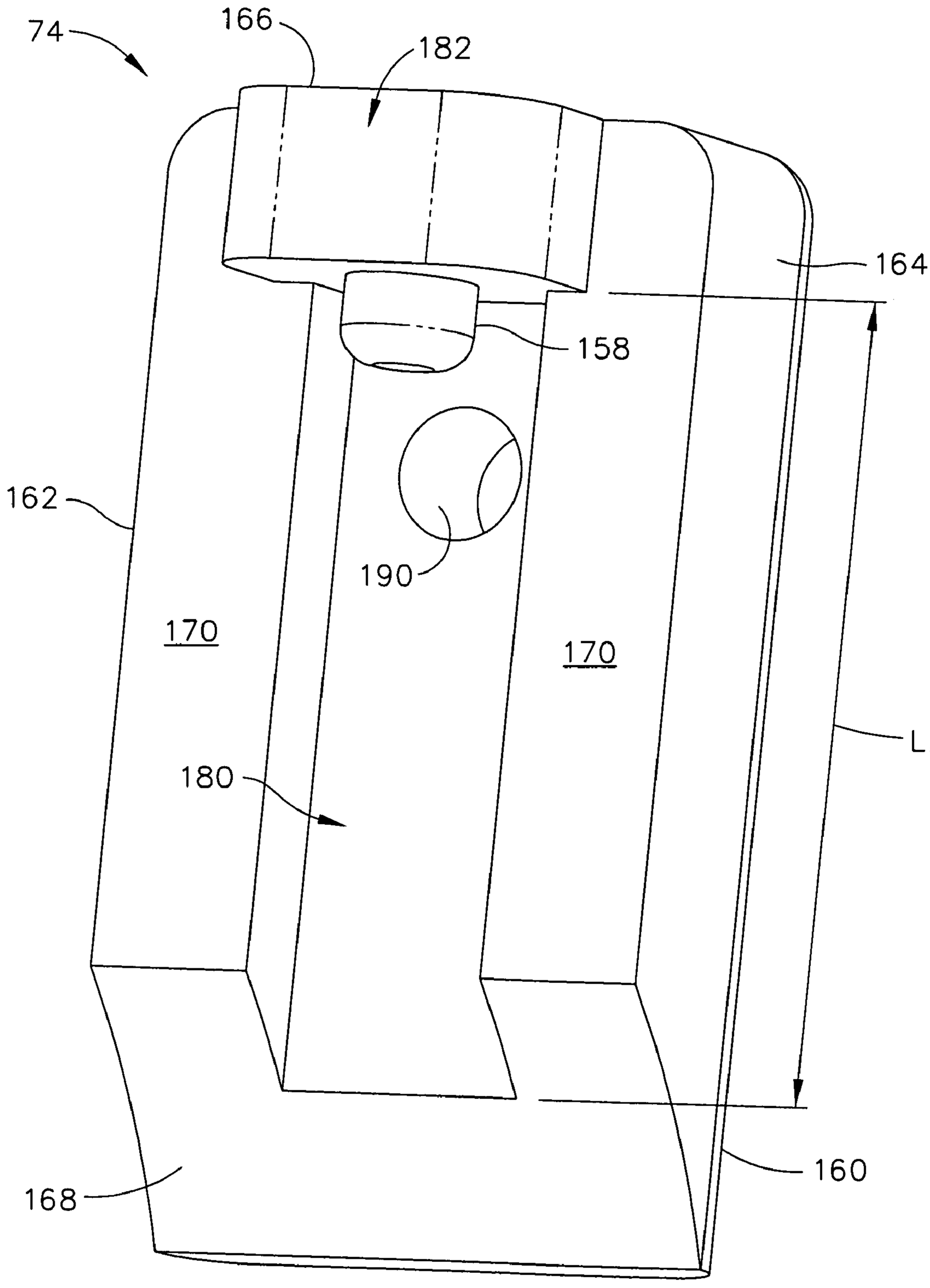

FIG. 5

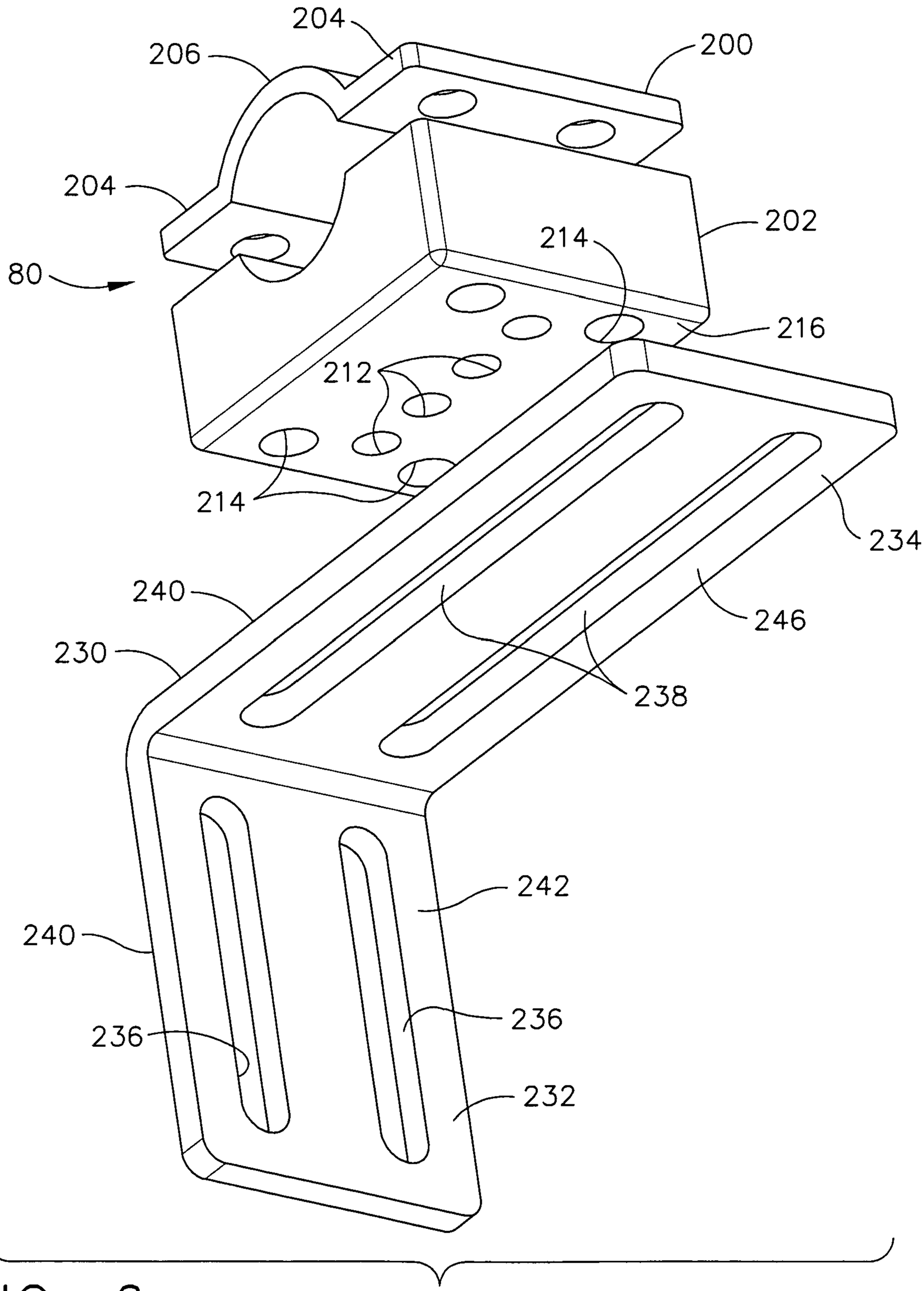
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FIG. 6

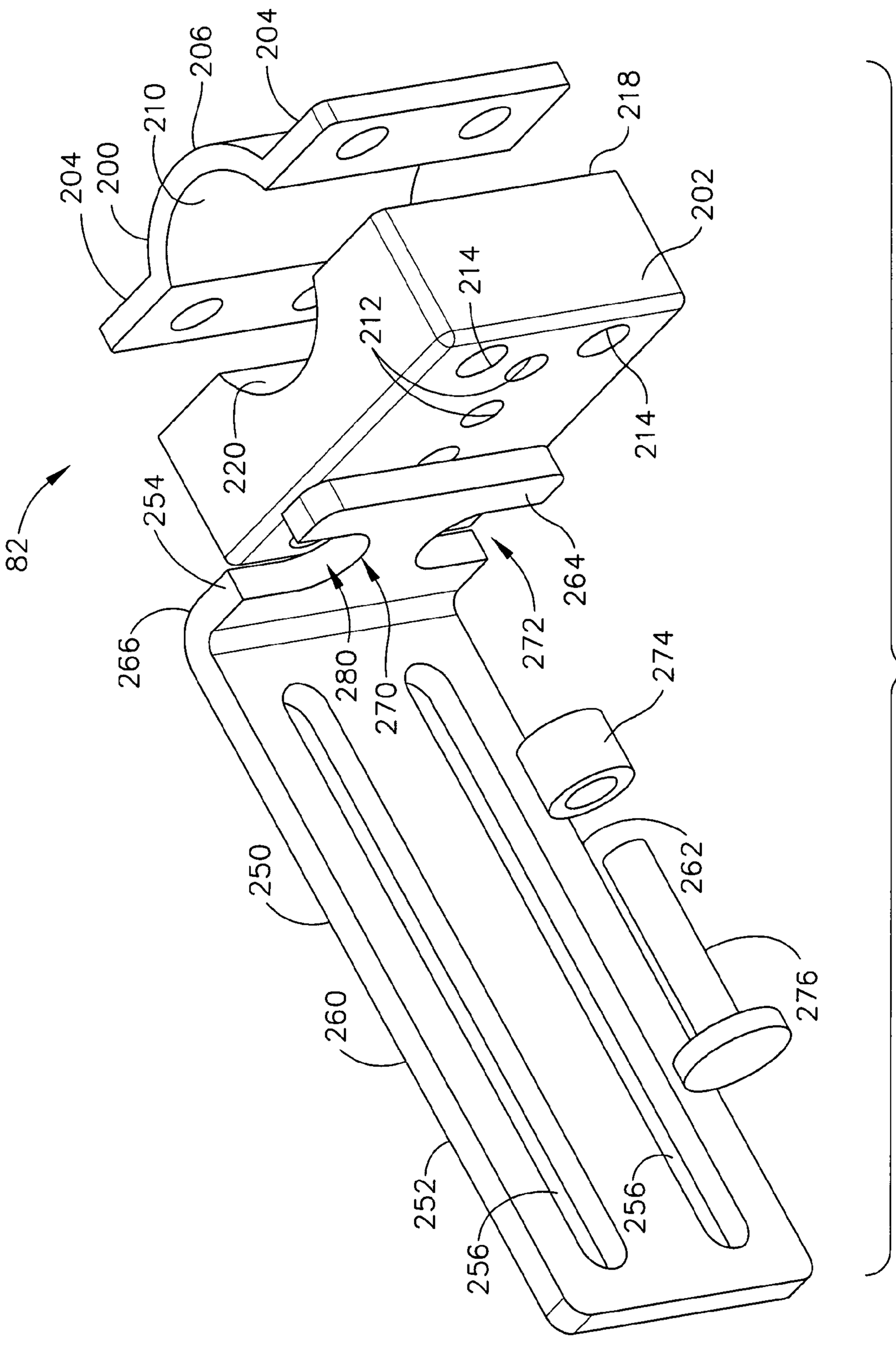
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FIG. 7

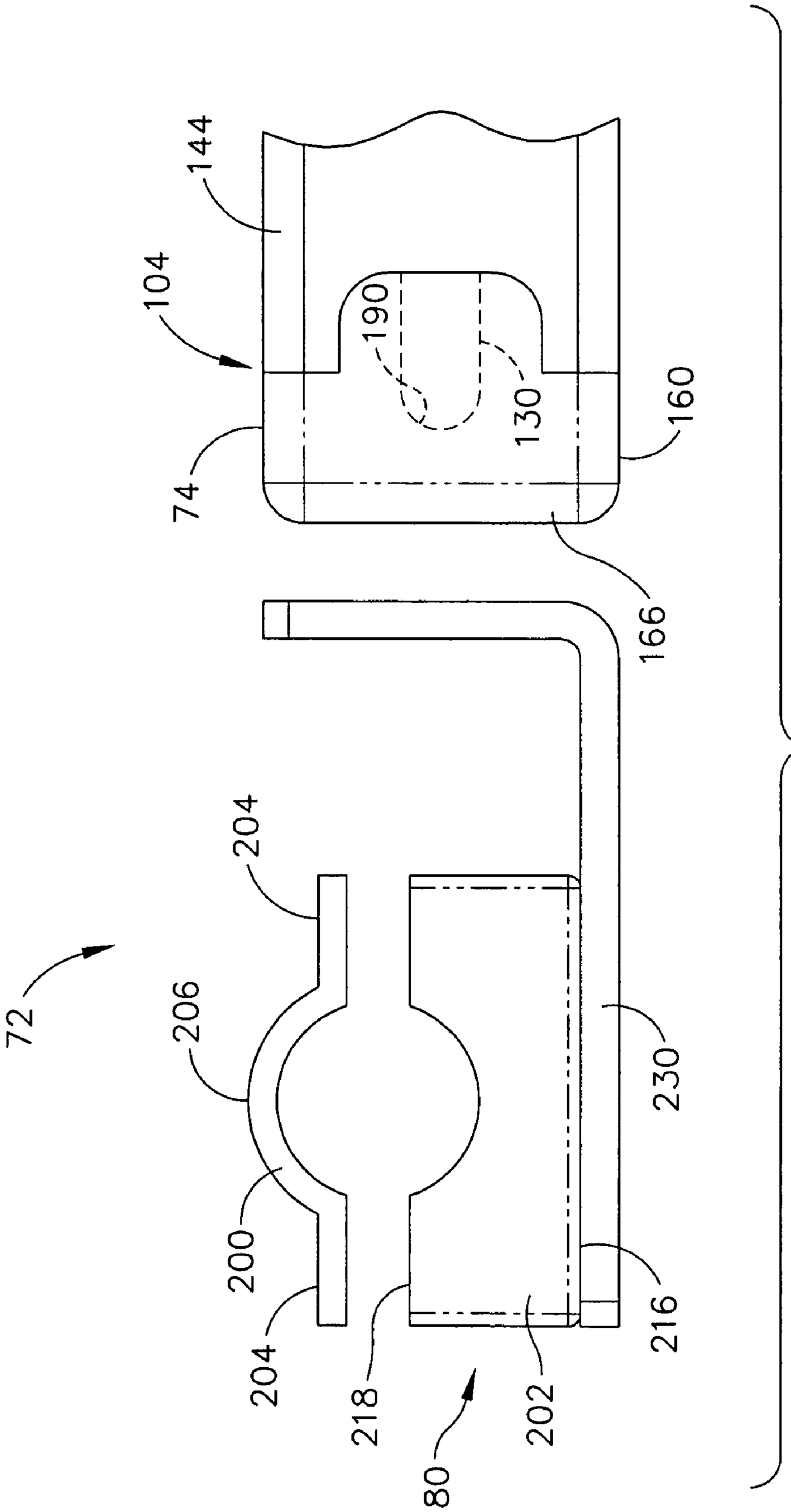

FIG. 8

METHODS AND APPARATUS FOR ASSEMBLING A WHEEL CHAIR

BACKGROUND OF THE INVENTION

This invention relates generally to wheelchairs, and more particularly, to back assemblies used with wheelchairs.

At least some known wheelchairs include an upholstery sling back that may be removed and/or folded for storage. However, because such wheelchair backs are generally not adjustable, such sling backs may not be comfortable to an individual confined in a wheelchair, and as such, may actually increase the health risks to such individuals. More specifically, the posture of individuals who are confined to wheelchairs may be a significant factor in the health problems associated with the individual. For example, over time, the posture of an individual confined to a wheelchair may increase the individual's risk for progressive spinal deformations, reduced mobility, fatigue, impaired respiration or swallowing, and/or tissue breakdown.

To facilitate reducing the risks of posture-related health problems and to increase the comfort to such individuals, at least some known wheelchairs have replaced the conventional back assemblies with back assemblies that are adjustable. More specifically, at least some known systems have attempted to provide a back assembly that is not only adjustable while a user is seated in the wheelchair, but is also attachable to, and/or detachable from, the wheelchair, while the user is seated in the wheelchair. For example, U.S. Pat. No. 5,556,168 to Jay et al. describes a wheelchair back system that is removably coupled to a wheelchair frame and includes height adjustability, tilt adjustability, and lateral support adjustability. Moreover, because the back system described in U.S. Pat. No. 5,556,168 is detachable from, and/or attachable to, the wheelchair in a single-handed operation that does not require the disengagement of, and/or installation of, other latching hardware from the back system, the back system overcame many of the installation/removal problems associated with other known removable wheelchair back systems.

However, depending on the type of wheelchair used, and/or the dexterity and overall condition of the wheelchair user, attaching or detaching the back system described in U.S. Pat. No. 5,556,168 may still be difficult. For example, the back system includes a pair of hook assemblies which each include a plurality of moving parts which may provide pinch points to the user, and/or locations in which a user's clothing may become entangled. Moreover, if either hook assembly becomes jammed, the back system may require an extensive disassembly to repair the hook assembly.

BRIEF SUMMARY OF THE INVENTION

In one aspect, a wheelchair back assembly for mounting to a pair of spaced apart laterally-aligned support posts of a wheelchair back frame is provided. The back assembly includes a relatively rigid shell member, and a mounting system for coupling the shell member to the wheelchair back frame. The mounting system includes at least a first mounting bracket assembly, a second mounting bracket assembly, and a lateral member that is configured to be coupled to the first and second mounting bracket assemblies. The first mounting bracket assembly is configured to couple to a first of the wheelchair back frame support posts, and the second mounting bracket assembly is configured to couple to the second of the wheelchair back frame support posts. The lateral member is selectively operable to uncouple the shell member from the wheelchair back frame.

In another aspect, a wheelchair is provided. The wheelchair includes a back frame and a back assembly. The back frame includes a pair of spaced-apart support posts. The support posts are substantially laterally-aligned. The back assembly includes a relatively rigid shell member coupled between the pair of support posts, and a mounting system for coupling the shell member to the back frame. The mounting system includes a first mounting bracket assembly, a second mounting bracket assembly, and a lateral member that is coupled therebetween. The lateral member is configured to couple to each of the support posts and is selectively operable to uncouple the shell member from the back frame.

In a further aspect, a method for assembling a back assembly for a wheelchair is provided. The method comprises coupling a first mounting bracket assembly to a first support post of a wheelchair back frame, and coupling a second mounting bracket assembly to a second support post of the wheelchair back frame. The method also comprises coupling a lateral member to a relatively rigid shell member, and coupling the lateral member to the first and second mounting bracket assemblies such that the lateral member is selectively operable to uncouple the shell from the wheelchair back frame.

In yet another aspect, a back assembly for a wheelchair including a pair of laterally-aligned support posts is provided. The back assembly includes a shell member having an upper portion and a lower portion, and a mounting system for coupling the shell member between the support posts. The mounting system includes a first mounting bracket assembly, a second mounting bracket assembly, a coupling assembly, and a lateral member. The first mounting bracket assembly is configured to couple the shell upper portion to a first of the support posts, and the second mounting bracket assembly is configured to couple the shell upper portion to a second of the support posts. The coupler assembly is configured to couple between the first mounting bracket assembly and the shell member, and between the second mounting bracket assembly and the shell member. The lateral member extends across the shell member upper portion and is selectively operable to uncouple the shell member from the coupler assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an exemplary conventional folding wheelchair;

FIG. **2** is a perspective rear view of an exemplary back assembly that may be used with the wheelchair shown in FIG. **1**;

FIG. **3** is an enlarged perspective view of a portion of a mounting system used with the back assembly shown in FIG. **2**;

FIG. **4** is an exploded view of the portion of the mounting system shown in FIG. **3**;

FIG. **5** is a side perspective view of a portion of the mounting system shown in FIG. **4**;

FIG. **6** is an enlarged exploded view of an upper mounting bracket assembly used with the back assembly shown in FIG. **2**;

FIG. **7** is a partially exploded enlarged view of a lower mounting bracket assembly used with the back assembly shown in FIG. **2**; and

FIG. **8** is a cross-sectional view of the mounting system shown in FIG. **3** and coupled to the upper mounting bracket assembly shown in FIG. **6**; and

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a perspective view of an exemplary folding wheelchair **10**. Wheelchair **10** is known in the art and includes a pair

of side frames **12** connected by a folding strut arrangement **14** as well as a folding lock arrangement **16** including a front hinged brace **18** and a rear hinged brace **20**.

In the exemplary embodiment, each side frame **12** includes a lower frame unit **30**, a seat rail **32**, a front support unit **34**, a back support unit **36**, a back frame rail or support post **38**, a side connecting link **40**, and an armrest support unit **42**. Armrest support unit **42** includes a generally horizontally-aligned member **44** and a generally vertically-aligned member **46** that is pivotally coupled between member **44** and an intersection **50** formed by the coupling of front support unit **34**, seat rail **32**, and side connecting link **40**. Each armrest support unit member **44** is coupled between member **46** and back frame support post **38**.

Support posts **38** each have a diameter D and are spaced apart a distance W and each extends generally perpendicularly upwardly from lower frame unit **30** to a pair of support post handles **52**. Accordingly, posts **38** are substantially parallel to each other, and as such, are generally laterally-aligned. In the exemplary embodiment, posts **38** are also coupled together by a pair of strut members **54** and **56** which are pivotally secured together approximately mid-way along their lengths. More specifically, the upper ends **58** and **60** of respective members **54** and **56** are rotationally, and pivotally, coupled to support posts **38**, and are rotationally and pivotally mounted to back support units **36**.

FIG. **2** is a perspective rear view of exemplary back assembly **70** that may be used with a wheelchair, such as wheelchair **10** (shown in FIG. **1**). FIG. **3** is an enlarged perspective view of a portion of a mounting system **72** used with back assembly **70** and including a lateral member **100** and a coupling assembly **74**, and FIG. **4** is an exploded view of mounting system **72**. FIG. **5** is a side perspective view of coupling assembly **74**. FIGS. **6** and **7** are respectively an enlarged exploded view of an upper mounting bracket assembly **80** and a partially exploded enlarged view of a lower mounting bracket assembly **82** used with back assembly **70**. FIG. **8** is a cross-sectional view of mounting system **72** coupled to upper mounting bracket assembly **80**.

Wheelchair back assembly mounting system **72** is used to mount a relatively rigid shell member **84** to wheelchair back frame posts **38**. More specifically, and as described herein, mounting system **72** provides a universal mounting system which enables shell member **84** to be coupled to a plurality of different wheelchairs **10** having different widths W and/or different support post diameters D (shown in FIG. **1**). Moreover, mounting system **72** also enables shell member **84** to be coupled to posts **38** (shown in FIG. **1**) which have a different curvature or tilt than those illustrated in FIG. **1**. As such, mounting system **72** facilitates enabling wheelchair back assembly **70** to be retrofitted on existing wheelchairs, and/or installed as original equipment on new wheelchairs.

Shell member **84** is hard, relatively rigid matrix which is sized to extend laterally between wheelchair posts **38** to provide mechanical support to a back cushion (not shown) coupled thereto. Shell member **84** is contoured to facilitate providing lumbar support and lateral support to a seated user. More specifically, in the exemplary embodiment, the contour of shell member **84** also enables shell member **84** to generally conform to the slight backward bend of wheelchair posts **38**. In an alternative embodiment, shell member **84** has a different contour and/or exterior shape defined by an outer perimeter of shell member **84**. More specifically, the shell outer perimeter is defined by an upper edge **90**, a lower edge **92**, and a pair of opposite side edges **94** that extend between the upper and lower edges **90** and **92**, respectively.

In the exemplary embodiment, mounting system **72** includes a pair of upper mounting bracket assemblies **80**, a pair of lower mounting bracket assemblies **82**, and lateral support member **100**. Upper mounting bracket assemblies **80** facilitate removably coupling an upper portion **96** of shell member **84** to wheelchair back frame posts **38**, and lower mounting bracket assemblies **82** facilitate removably coupling a lower portion **97** of shell member **84** to posts **38**.

Lateral support member **100** is formed symmetrically about a center axis of symmetry **102** and is formed integrally with a pair of ends **104** and **106**, and a body **108** extending therebetween. In one embodiment, lateral support member **100** is formed integrally with shell member **84**. Body **108** has a width W_B measured between an inner surface **112** and an outer surface **113** of body **108**. In an alternative embodiment, lateral support member **100** is formed non-symmetrically. Inner surface **112** is contoured such that width W_B is variable across body **108** between ends **104** and **106**. More specifically, in the exemplary embodiment, body inner surface **112** has a contour that substantially matches a contour of shell member **84**. Accordingly, and as described in more detail below, body inner surface **112** enables body **108** to substantially mate against a rear exterior surface **114** of shell member upper portion **96** when lateral support member **100** is coupled to shell member **84**.

In the exemplary embodiment, lateral support member **100** is coupled against shell member **84** by a series of threaded fasteners (not shown) which extend through a plurality of openings (not shown) formed in shell member **84** and into corresponding openings (not shown) formed in, and extending into body **108** from body inner surface **112**. In an alternative embodiment, support member **100** is coupled to body **108** using any coupling means that enables support member **100** to function as described herein.

Body **108** is also formed integrally with a handle portion **120** which, as described in more detail below, enables a user to selectively uncouple, or couple, shell member **84** from wheelchair back frame posts **38** using only one hand. More specifically, the combination of mounting system **72** and lateral member hand portion **120** enables even a user with limited hand functionality to install and/or remove shell member **84** to wheelchair back frame posts **38** in a single-handed operation.

Handle portion **120** is mechanically coupled to a pair of retaining pins **130** that are biased to extend radially outwardly through an opening **132** formed in each end **104** and **106**. In the exemplary embodiment, pins **130** are biased through a spring-mechanism and are retractable when pressure is exerted to handle portion **120**. More specifically, and as described in more detail below, when an upward force is induced to an activator portion **134** of handle portion **120**, pins **130** are retracted, such that each pin **130** is drawn through opening **132** and into body **108**.

Each end **104** and **106** of lateral member **100** is formed with a coupling portion **140** and an interlock portion **142**. In the exemplary embodiment, coupling portion **140** is a male rail portion used within a tongue and groove coupling arrangement, and thus has a dovetail-shaped cross-sectional profile. In alternative embodiments, coupling portion **140** has a cross-sectional profile that is not dovetail-shaped. In another alternative embodiment, coupling portion **140** is formed as a female coupling portion within a tongue and groove coupling arrangement. More specifically, in the exemplary embodiment, coupling portion **140** extends widthwise from inner surface **112** for a length L to interlock portion **142**. In an alternative embodiment, coupling portion **140** extends at least partially lengthwise between upper and lower sides **144** and

146, respectively, of support member **100**. In a further alternative embodiment, coupling portion **140** extends only partially widthwise across each end **104** and **106** and as such does not extend from inner surface **112**. Length L is shorter than body width W_B measured adjacent each end **104** and **106**. Moreover, in the exemplary embodiment, coupling portion **140** is substantially centered between upper and lower sides **144** and **146**, respectively, of support member **100**.

Because coupling portion length L is shorter than body width W_B, a coupling portion rear surface **150** is defined. More specifically, in the exemplary embodiment, surface **150** extends generally perpendicularly between an outer surface **152** of coupling portion **140** and a radially inner surface **154** of interlock portion **142**. In the exemplary embodiment, an alignment pin opening **156** extends substantially concentrically through surface **150**. Alignment pin opening **156** is sized to receive an alignment pin **158** therein, as described in more detail below.

Opening **132** extends through coupling portion **140** and is sized to receive a retracting pin **130** therethrough. More specifically, in the exemplary embodiment, opening **132** is substantially concentrically aligned within coupling portion **140** between upper and lower surfaces **144** and **146**, respectively.

Interlock portion **142** extends from coupling portion surface **150** to lateral support member outer surface **113**. In the exemplary embodiment, interlock portion **142** is recessed with respect an outer surface **157** of each end **104** and **106**. Moreover, in the exemplary embodiment, interlock portion **142** has a generally rectangular recessed profile defined by surface **154**. More specifically, and as described in more detail below, interlock portion **142** is sized to receive at least a portion of coupling assembly couplers **160** therein in an interlocked coupling arrangement. In an alternative embodiment, coupling portion **140** extends only partially widthwise across each end **104** and **106** and in such an embodiment, each end **104** and **106** can be formed with an interlock portions **142** at each end of coupling portion **140**.

Coupling assembly **74** includes a pair of opposed couplers **160** that are in a mirrored relationship. Each coupler **160** is configured to releasably couple to each end **104** and **106** of lateral support member **100**. In the exemplary embodiment, each coupler **160** includes a top side **162** and a bottom side **164** coupled together by an end wall **166**, an opposite inner end wall **168**, an inner surface **170**, and an outer surface **172**. Inner surface **170** is opposite outer surface **172** and may be contoured with a shape that substantially matches a contour of at least a portion of shell member **84**. Coupler inner end wall **168** is contoured to substantially match a contour of at least a portion of shell member **84**. Accordingly, and as described in more detail below, inner surface **168** enables coupler **160** to substantially mate against a portion of shell member rear exterior surface **114** when coupler **160** is coupled in position relative to back assembly **70**.

Each coupler **160** is formed with a coupling portion **180** and an interlock portion **182**. In the exemplary embodiment, coupling portion **180** is a female grooved portion used within a tongue and groove coupling arrangement, and thus has a recessed dovetail-shaped profile that is substantially similar to that of lateral member coupling portion **140**. Accordingly, coupling portion **180** is sized to slidably engage lateral ends **104** and **106** in releasable contact. In alternative embodiments, coupling portion **180** has a recessed profile that is not dovetail-shaped, but rather is shaped substantially similar to that of lateral member coupling portion **140** to enable lateral member ends **104** and **106** to be coupled to couplers **160** in slidable contact. In another alternative embodiment, coupling portion **180** is formed as a male coupling portion within a tongue and groove coupling arrangement. More specifically, in the exemplary embodiment, coupling portion **180** extends widthwise from inner surface **168** for a length L_C to coupler interlock portion **182**. Depending on the contour of shell member **84**, length L_C is as long as, if not longer than, lateral member coupling portion **140**. Accordingly, coupling portion **180** is sized to receive lateral member coupling portion **140** therein. Moreover, in the exemplary embodiment, coupling portion **180** is substantially centered between upper and lower sides **162** and **164**, respectively, of support member **100**.

In the exemplary embodiment, a retaining pin opening **190** extends through coupler **160** between outer surface **166** and inner surface **170**. More specifically, opening **190** is substantially centered within coupling portion **180** between upper and lower sides **162** and **164**, and each opening **190** is sized to receive a portion of a retaining pin **130** therein.

Coupler interlock portion **182** extends widthwise between coupling portion **180** and coupler outer surface **166**, and projects radially outwardly from coupler inner surface **170**. Coupler interlock portion **182** is shaped and sized to be received within lateral member recessed interlock portion **142**. More specifically, when couplers **160** are coupled to lateral support member **100**, lateral support member coupling portion **140** is slidably received within coupler coupling portion **180**, and coupler interlock portion **182** is received within lateral member interlock portion **182** to facilitate securing coupler **160** and lateral support member **100** in an interlocking coupling arrangement. Accordingly, when coupler **160** is fully secured and removably coupled to lateral support member **100**, coupler outer surface **166**, will be substantially co-planar with lateral support member outer surface **113**. Moreover, coupler upper and lower sides **162** and **164**, respectively, will also be substantially co-planar with respective lateral support member upper and lower sides **144** and **146**.

Alignment pin **158** extends outwardly from coupler interlock portion **182** into coupling portion **180**. More specifically, in the exemplary embodiment, alignment pin **158** extends substantially perpendicularly from a radial inner surface **184** of interlock portion **182** and is substantially co-axially aligned with respect to coupling portion **180**. Pin **158** is sized to be received within a respective alignment pin opening **156**, and, as described in more detail below, facilitates aligning and securing lateral support member **100** with respect to coupler **160**.

Coupler **160** also includes a plurality of fastener openings (not shown) extending at least partially through coupler **160** from coupler outer surface **172** towards coupler inner surface **170**. In the exemplary embodiment, coupler **160** is coupled to mounting bracket assembly **80** using a plurality of threaded fasteners (not shown) which extend into, and/or through, the fastener openings formed in coupler **160**. In an alternative embodiment, coupler **160** is coupled to bracket assembly **80** using any coupling means that enables coupler **160** to function as described herein.

In the exemplary embodiment, each upper mounting bracket assembly **80** is identical to each lower mounting bracket assembly **82**, and each includes a frame member **200** that couples to an alignment member **202**. Each frame member **200** includes a pair of fastening flanges **204** and an arcuate body **206** extending therebetween. Arcuate body **206** is contoured with a shape that enables an inner surface **210** of body **206** to substantially mate against an outer surface **212** (shown in FIG. **1**) of a portion of a respective pole **38** when a respective bracket assembly **80** or **82** is securely coupled to pole **38**. In the exemplary embodiment, arcuate body **206** is formed with a radius of curvature that is sized to receive at least a portion of a respective pole **38** therein.

Each fastening flange **204** includes a plurality of openings **214** extending therethrough. Each opening **214** is sized to receive a fastener (not shown) therethrough for coupling frame member **200** to alignment member **202**. In the exemplary embodiment, fastening flanges **204** are substantially planar.

To facilitate reducing snag points, frame members **200** and alignment members **202** are sized approximately equal to each other based on the outer perimeters of each member **200** and **202**. Accordingly, when portions **200** and **202** are coupled together, no edges overhang from either member **202** or **200**. Alignment members **202** each include a plurality of orientation openings **212** formed therein which, as described in more detail below, facilitate selective orientation of shell member **84** with respect to wheelchair **10**. More specifically, in the exemplary embodiment, openings **212** extend at least partially through member **202** from an alignment face **216** of member **202** to an inner surface **218** of member **202**. Inner surface **218** is formed with an arcuate recessed portion **220** that is contoured with a shape that enables alignment member inner surface **218** to substantially mate against a portion of pole outer surface **212** when a respective bracket assembly **80** or **82** is securely coupled to pole **38**. In the exemplary embodiment, arcuate recessed portion **220** is formed with a radius of curvature that is sized to receive at least a portion of a respective pole **38** therein.

Coupling assembly **74** is coupled to upper mounting bracket assembly **80** through a positioning bracket **230**. More specifically, positioning bracket **230**, as described in more detail below, not only enables each coupler **160** to be secured to each respective mounting bracket **80**, but also enables each coupler to be variably positioned with respect to poles **38**. In the exemplary embodiment, positioning bracket **230** includes a pair substantially perpendicular legs **232** and **234** coupled together such that bracket **230** has a substantially L-shaped cross-sectional profile. Alternatively, bracket **230** has a non-L-shaped cross-sectional profile. Each leg **232** and **234** includes a pair of slotted openings **236** and **238**, respectively. In the exemplary embodiment, openings **236** or **238** are identically sized within each respective leg **232** and **234**. In an alternative embodiment, slotted openings **236** and/or **238** may be any shape or size that enables positioning bracket **230** to function as described herein. In a further alternative embodiment, positioning bracket **230** does not include slotted openings **236** and/or **238** but rather includes a plurality of spaced openings which enable positioning bracket **230** to function as described herein.

Bracket leg **232** includes an outer surface **240** and an opposite inner surface **242**. In the exemplary embodiment, leg **232** is substantially planar such that surfaces **240** and **242** are substantially parallel. Similarly, bracket leg **234** also includes an outer surface **244** and an inner surface **246**, and in the exemplary embodiment, leg **234** is substantially planar such that surfaces **244** and **246** are substantially parallel. In an alternative embodiment, either leg **232** and/or **234** is non-planar. It should be noted that the illustrations of FIGS. **6** and **8** are merely exemplary and as such, bracket **230** may be fabricated with any size, or leg dimensions that enable bracket **230** to function as described herein. For example, although leg **234** is shown as having a longer length than leg **232**, the lengths of legs **234** and **232** are variably selected depending on the dimensions of the wheelchair **10**, such as post spacing W, back assembly **70** is coupled to.

Shell member lower portion **97** is removably coupled to lower mounting bracket assembly **82** through a positioning bracket **250**. More specifically, positioning bracket **250**, as described in more detail below, not only enables shell member **84** to be removably coupled to each post **38**, but also facilitates orienting and/or variably positioning shell member lower portion **97** with respect to poles **38**. In the exemplary embodiment, positioning bracket **250** includes a pair substantially perpendicular legs **252** and **254** coupled together such that bracket **250** has a substantially L-shaped cross-sectional profile. Alternatively, bracket **250** has a non-L-shaped cross-sectional profile. Leg **252** includes a pair of slotted openings **256** which facilitate variably positioning shell member **84** with respect to poles **38**. In the exemplary embodiment, openings **256** are identically sized. In an alternative embodiment, slotted openings **256** may be any shape or size that enables positioning bracket **250** to function as described herein. In a further alternative embodiment, positioning bracket **250** does not include slotted openings **256** but rather includes a plurality of spaced openings which enable positioning bracket **250** to function as described herein.

Bracket leg **252** includes an outer surface **260** and an opposite inner surface **262**. In the exemplary embodiment, leg **252** is substantially planar such that surfaces **260** and **262** are substantially parallel. Similarly, bracket leg **254** also includes an outer surface **264** and an inner surface **266**, and in the exemplary embodiment, leg **254** is substantially planar such that surfaces **264** and **266** are substantially parallel. In an alternative embodiment, either leg **252** and/or **254** is non-planar. It should be noted that as illustrated, positioning bracket **250** is merely exemplary and as such, bracket **250** may be fabricated with any size, or leg dimensions that enable bracket **250** to function as described herein.

Bracket leg **254** is formed with an upper and a lower hinge bracket **270** and **272**. Each bracket is sized to receive a sleeve **274** therein to facilitate hingedly coupling shell member **84** to mounting bracket assembly **82** through positioning bracket **250**. More specifically, sleeve **274** is coupled to mounting bracket alignment member **202** by a fastener **276** inserted into any of the orientation openings **212** formed within member **202**. Accordingly, in the exemplary embodiment, each hinge bracket **270** and **272** is formed with an arcuate portion **280** that has a radius of curvature that is sized to enable sleeve **274** to be received therein in close tolerance, and such that bracket **250** is then rotatably coupled to mounting bracket assembly **82**, as is described in more detail below.

During use, wheelchair back assembly **70** facilitates mounting shell member **84** to wheelchair back frame posts **38**, and more specifically, back assembly **70** includes a universal mounting system **72** which enables shell member **84** to be coupled to a plurality of different sized and/or shaped wheelchairs **10** having different post widths W and/or different support post diameters D. Moreover, mounting system **72** also enables shell member **84** to be coupled to wheelchair support posts **38** which have a different curvature or tilt than those illustrated in FIG. **1**. Accordingly, wheelchair back assembly may be used to retrofit existing wheelchairs to replace existing back assemblies, and/or installed as original equipment on new wheelchairs.

When coupling back assembly **70** to a wheelchair **10** for the first time during a retrofit of an existing wheelchair **10**, or during assembly of a newly manufactured wheelchair **10**, initially lateral support member **100** is coupled to shell member **84** such that member **100** extends across the upper portion **96** of shell member **84** and between shell side edges **94**. More specifically, when coupled in position, lateral member inner surface **112** is coupled tightly against shell member rear exterior surface **114**, and handle portion **120** is positioned between shell upper edge **90** and lateral support member lower side **146**. Moreover, once coupled to shell member **84**, lateral support member **100** extends generally parallel to shell member upper edge **90**.

A pair of positioning brackets **250** are then fixedly secured to shell member **84** along shell side edges **94**. Depending on the design of wheelchair **10**, bracket **250** may be secured to shell member lower portion **97** such that either leg surface **260** or **262** is secured tightly against shell member exterior surface

114. More specifically, each bracket 250 is secured to shell member 84 using a plurality of fasteners which extend through slotted openings 256 and at least partially through shell member 84. Alternatively, brackets 250 may be coupled to shell member 84 using any coupling means that enables brackets 250 to function as described herein. Moreover, in the exemplary embodiment, bracket slotted openings 256 enable each bracket hinge bracket 270 or 272 to be selectively positioned with respect to shell member 84 and with respect to posts 38.

Each mounting bracket assembly 80 and 82 is then securely coupled to each respective post 38. More specifically, bracket assembly frame member 200 is coupled to each respective alignment member 202 using a plurality of fasteners. Alternatively, mounting bracket assemblies 80 and 82 are secured to posts 38 using any coupling means that enables bracket assemblies 80 and 82 to function as described herein. Accordingly, when members 200 are securely coupled to members 202, each post 38 is secured between members 200 and 202. The combination of the multi-piece nature of bracket assemblies 80 and 82, and the radius of curvature of surfaces 220 and 206 enables bracket assemblies 80 and 82 to be used with support poles having a plurality of different diameters D.

A pair of positioning brackets 230 are then fixedly secured to upper mounting bracket assemblies 80. Depending on the design of wheelchair 10, each bracket 230 may be secured to shell member lower portion 97 such that the inner surface 242 or 246, or the outer surface 240 or 244 is secured tightly against mounting bracket alignment face 216. More specifically, each bracket 230 is secured to mounting bracket assembly 80 using a plurality of fasteners which extend through slotted openings 236 or 238 and at least partially through fastening flange openings 214. Alternatively, brackets 230 may be coupled to mounting bracket assemblies 80 using any coupling means that enables brackets 230 to function as described herein. Moreover, in the exemplary embodiment, the combination that either positioning bracket leg 232 or 234 may be coupled against mounting bracket assembly 80, and the bracket slotted openings 236 or 238 facilitate each positioning bracket 230 being variably positioned to selectively orient shell member upper portion 96 with respect to support poles 38 and with respect to wheelchair 10.

Coupling assembly 74 is then coupled to upper mounting bracket assembly 80 such that each coupler 160 is fixedly secured to each positioning bracket 230. More specifically, in the exemplary embodiment, each coupler 160 is coupled to each bracket 230 using a plurality of fasteners which are extended through the positioning bracket slotted openings 236 or 238 and at least partially into the fastener openings formed in coupler outer surface 172.

Each fastener 276 is then inserted through a respective sleeve 274 and inserted into an applicable orientation opening 212 formed within lower bracket assembly member 202. More specifically, the plurality of openings 212 enable shell member lower portion 97 to be variably positioned with respect to posts 38 and with respect to wheelchair 10.

Shell member lower portion 97 is then hingedly coupled to posts 38 through positioning brackets 250 and from the front side of wheelchair 10. More specifically, each positioning bracket 230 is positioned adjacent a respective lower bracket assembly member 202 such that each sleeve 274 is received within an the lower hinge bracket 270 and/or 272 on each positioning bracket 250.

Shell member 84 is then rotated backwards and away from a front edge of wheelchair 10 such that end 104 and 106 of lateral member 100 is slidably coupled to each respective coupler 160. More specifically, as shell member 84 is rotated backwards, each lateral member coupling portion 140 is received in slidable contact within each respective coupler coupling portion 180. As shell member 84 is rotated in a further direction backwards, each coupler interlock portion 182 is received within each respective lateral member interlock portion 142. More specifically, as interlock portion 182 is received within interlock portion 142, each alignment pin 158 is inserted in an interference fit within each respective lateral member opening 156. Additionally, once interlock portion 182 is fully seated within interlock portion 142, each retaining pin 130 is biased into, and received within, each respective coupler opening 190. Accordingly, once pins 130 are received within openings 190, lateral member 100 is removably coupled to each coupler 160, and thus to wheelchair 10, in an interlocked coupling arrangement. Moreover, the biasing of pins 130 prevents the inadvertent uncoupling of shell member from couplers 160.

Accordingly, when desired, a seated user may easily uncouple shell member 84 from wheelchair 10 using only one hand. More specifically, as a minimum force is applied to lateral member handle portion 120, retaining pins 130 are drawn into lateral support member 100 from openings 190. After pins 130 have been retracted from openings 190, shell member 84 may be rotated forward towards the front edge of wheelchair 10, such that each end 104 and 106 of lateral support member 100 is slidably uncoupled from each coupler 160. Continued rotation of shell member 84 uncouples shell member upper portion 96 from posts 38, such that shell member lower portion 97 may be uncoupled from posts 38 by merely lifting shell member 84 until each sleeve 274 is no longer positioned within an applicable lower hinge bracket 270 and/or 272. The remaining back assembly mounting system hardware remains coupled to wheelchair 10, even if wheelchair 10 is folded for storage and/or transportation.

As such, the combination of brackets 230 and 250, and mounting bracket assemblies 80 and 82 enable shell member 84 to be selectively adjusted relative to the wheelchair 10. Specifically, bracket assemblies 80 and 82 accommodate height adjustments that may be required, such that shell member 84 may be raised or lowered along wheelchair posts 38. Moreover, brackets 230 and 250 enable all, or a portion such as 96 or 97 of shell member 84, to be tilted forward or rearward to accommodate the stabilization and therapeutic requirements of the seated user. Accordingly, wheelchair back assembly 84 is easily adjustable, and is easily attached or detached from wheelchair 10 in a single-hand operation.

The above-described wheelchair back assembly provides a user with a high degree of support and adjustablity, and thus accommodates a plurality of therapeutically significant adjustments and orientations. Specifically, the wheelchair back assembly includes a universal mounting system that is usable with a plurality of different sized and shaped wheelchairs. The mounting system is removably coupled to the wheelchair in a manner that enables a user to easily detach and reattach the shell member to the wheelchair, even a user having limited hand dexterity or function. An upper portion of the shell member is slidably coupled to the wheelchair posts in an interlocking coupling arrangement that prevents the inadvertent uncoupling of the shell member from the wheelchair. The lower portion of the shell member is pivotally coupled to the wheelchair posts in a hinged coupling arrangement. As a result, a removable wheelchair back assembly is provided which facilitates increasing the adjustability options available to a user in a cost-effective and reliable manner.

Exemplary embodiments of wheelchair back assemblies are described above in detail. Although the back assemblies are herein described and illustrated in association with seated users, it should be understood that the present invention may be used with a plurality of different wheelchairs. Moreover, it should also be noted that the components of each wheelchair back assembly are not limited to the specific embodiments described herein, but rather, aspects of each back assembly

component and method of assembly may be utilized independently and separately from other methods described herein.

In addition, although in the described embodiment, the angular movement of the wheelchair shell member is in a generally vertical plane when the shell member is being attached to or detached from the wheelchair posts, in alternative embodiments, the wheelchair shell member could be moved in a generally horizontal rotational plane or at some other angular orientation as well. Furthermore, instead of the lower positioning brackets being the direct pivot point, alternate pivot points could be formed along the sides of the shell member, and/or fitted to a shape on the posts, in order to get the same type of rotational movement and hinged coupling.

In addition, although the wheelchair back assembly is described has having four mounting bracket assemblies, in alternative embodiments, the back assembly could have more or less than four mounting assemblies, depending on the desired application. Moreover, the lower mounting assemblies do not have to be hingedly coupled, but rather some other removable coupling means, such as the same coupling arrangement used with the upper mounting assemblies, could be used.

While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the claims.

What is claimed is:

1. A wheelchair back assembly for mounting to a pair of spaced apart laterally-aligned support posts of a wheelchair back frame, said back assembly comprising:

a relatively rigid shell member;

a mounting system for coupling said shell member to the wheelchair back frame,

said mounting system comprising at least a first mounting bracket assembly, a second mounting bracket assembly, and a lateral member configured to be coupled to said first and second mounting bracket assemblies such that said lateral member extends from said first mounting bracket assembly to said second mounting bracket assembly, said first mounting bracket assembly configured to couple to a first of the wheelchair back frame support posts, said second mounting bracket assembly is configured to couple to the second of the wheelchair back frame support posts, said lateral member is selectively operable to uncouple said shell member from the wheelchair back frame; and

a coupling system for removably coupling said shell member to said mounting system, said coupling system comprising a first coupler assembly configured to couple to said first mounting bracket assembly and a second coupler assembly configured to couple to said second mounting bracket assembly, said lateral member comprises at least one biasing member configured to bias said lateral member into coupling contact with at least one of said coupler assemblies.

2. A wheelchair back assembly in accordance with claim **1** wherein said first and second coupler assemblies are each configured to be removably coupled to a respective end of said lateral member.

3. A wheelchair back assembly in accordance with claim **1** wherein at least one of said first and second coupler assemblies is configured to slidably couple to said lateral member.

4. A wheelchair back assembly in accordance with claim **1** wherein at least one of said first and second coupler assemblies is configured to couple to said lateral member through a tongue and groove coupling arrangement.

5. A wheelchair back assembly in accordance with claim **1** wherein at least one of said first and second coupler assemblies is configured to couple to said lateral member such that said lateral member and said coupler assembly are interlocked.

6. A wheelchair back assembly in accordance with claim **1** wherein at least one of said first and second coupler assemblies comprises an alignment pin sized to be at least partially received within an opening defined within said lateral member.

7. A wheelchair back assembly in accordance with claim **6** wherein said alignment pin facilitates positioning said lateral member with respect to said coupler assembly.

8. A wheelchair back assembly in accordance with claim **1** wherein said lateral member comprises a pair of ends and a body extending laterally therebetween, said body is coupled against said shell member, each of said lateral member ends is removably coupled to a respective said coupler assembly.

9. A wheelchair back assembly in accordance with claim **8** wherein said lateral member at least one biasing mechanism is configured to bias said lateral member into coupling contact with each of said coupler assemblies.

10. A wheelchair back assembly in accordance with claim **1** wherein said at least one biasing mechanism comprises a retractable retaining pin, each said retaining pin is sized to be received at least partially within an opening defined in said coupler assemblies.

11. A wheelchair back assembly in accordance with claim **1** wherein said biasing mechanism is selectively operable to uncouple said shell member from the wheelchair back frame.

12. A wheelchair back assembly in accordance with claim **1** wherein said at least one biasing mechanism is configured for single-handed release of said shell member from the wheelchair back frame.

13. A wheelchair back assembly in accordance with claim **1** wherein said lateral member comprises a hand grip device, said hand grip device is selectably operable to uncouple said shell member from the wheelchair back frame.

14. A wheelchair back assembly in accordance with claim **12** wherein said hand grip device is configured for single-handed release of said shell member from the wheelchair back frame.

15. A wheelchair back assembly in accordance with claim **1** wherein said lateral member is configured to enable single-handed release of said shell member from the wheelchair back frame.

16. A wheelchair back assembly in accordance with claim **1** wherein said mounting assembly further comprises a third mounting bracket assembly and a fourth mounting bracket assembly, said third and fourth mounting bracket assemblies configured to couple said shell member to the wheelchair back frame such that said third mounting bracket assembly is coupled to the first wheelchair back frame support post and said fourth mounting bracket assembly is coupled to the second wheelchair back frame support post.

17. A wheel chair back assembly in accordance with claim **16** wherein said third and fourth mounting bracket assemblies are each configured to pivotally couple said shell member to the second wheelchair back frame support post.

18. A wheel chair back assembly in accordance with claim **16** wherein said third and fourth mounting bracket assemblies each comprise a plurality of openings defined therein, said openings for positioning said shell member with respect to the wheelchair back frame.

19. A wheelchair comprising:

a back frame comprising a pair of spaced-apart support posts, said support posts are substantially laterally-aligned; and

a back assembly comprising a relatively rigid shell member coupled between said pair of support posts, and a mounting system for slidably coupling said shell member to said back frame, said mounting system comprising a first mounting bracket assembly, a second mounting bracket assembly, a third mounting bracket assembly, and a lateral member coupled between said first and second mounting bracket assemblies, said lateral member is configured to extend from said first mounting bracket assembly to said second mounting bracket assembly and couple to each of said support posts and is selectively operable to uncouple said shell member from said back frame, said third mounting bracket assembly is configured to couple to said back frame such that said first and third mounting bracket assemblies are coupled to different portions of a first of said pair of support posts, and such that said second mounting bracket assembly is coupled to a second of said pair of support posts.

20. A wheelchair in accordance with claim 19 wherein said lateral member is configured for single-handed release of said shell member from said wheelchair back frame.

21. A wheelchair in accordance with claim 20 wherein said lateral member comprises a hand grip device.

22. A wheelchair in accordance with claim 19 wherein said back assembly further comprises a coupling system for removably coupling said shell member to said mounting system.

23. A wheelchair in accordance with claim 22 wherein said lateral member comprises a pair of ends and a body extending therebetween, said coupling system is configured to be removably coupled to each of said body ends.

24. A wheelchair in accordance with claim 23 wherein said lateral member comprises a pair of retaining pins configured to securely couple said shell member in position relative to said back frame.

25. A wheelchair in accordance with claim 24 wherein said pair of retaining pins are selectively retractable to facilitate uncoupling said shell member from said back frame.

26. A wheelchair in accordance with claim 22 wherein said lateral member comprises a pair of ends and a body extending therebetween, said coupling system is configured to slidably couple to each of said body ends.

27. A wheelchair in accordance with claim 22 wherein said lateral member comprises a pair of ends and a body extending therebetween, said coupling system is configured to couple to each of said body ends through a tongue and groove coupling arrangement.

28. A wheelchair in accordance with claim 22 wherein said lateral member comprises a pair of ends and a body extending therebetween, said coupling system is configured to slidably couple to each of said body ends.

29. A wheelchair in accordance with claim 22 wherein said lateral member is configured to couple with said coupling system such that said lateral member is interlocked to said coupling system.

30. A wheelchair in accordance with claim 29 wherein said coupling system comprises at least one alignment pin configured to facilitate interlocking between said lateral member and said coupling system.

31. A wheelchair in accordance with claim 19 wherein said mounting system further comprises a fourth mounting bracket assembly, said second and fourth mounting bracket assemblies are coupled to different portions of said second of said pair of support posts.

32. A wheelchair in accordance with claim 19 wherein said mounting system further comprises a third mounting bracket assembly and a fourth mounting bracket assembly, said third and fourth mounting bracket assemblies are configured to pivotally couple said shell member to said back frame.

33. A wheelchair in accordance with claim 19 wherein said mounting system further comprises a third mounting bracket assembly and a fourth mounting bracket assembly, said third and fourth mounting bracket assemblies are configured to couple said shell member to said back frame, each of said third and fourth mounting bracket assemblies comprises a plurality of openings for selectively positioning said shell member with respect to said back frame.

34. A back assembly for a wheelchair including a pair of laterally aligned support posts, said back assembly comprising: a shell member comprising an upper portion, a lower portion, and a lateral member, said shell member lower portion is pivotally coupled to the support posts; and

a mounting system for slidably coupling said shell member between the support posts, said mounting system comprising a first mounting bracket assembly, a second mounting bracket assembly, and a coupling assembly, said first mounting bracket assembly configured to couple said shell upper portion to a first of the support posts, said second mounting bracket assembly configured to couple said shell upper portion to a second of the support posts, said coupler assembly configured to couple between said first mounting bracket assembly and said shell member, and between said second mounting bracket assembly and said shell member, said lateral member extends across said shell member upper portion and is configured to be selectively operable to uncouple said shell member from said coupler assembly, said lateral member is biased into contact with said coupler assembly, said mounting system further comprises a third mounting bracket assembly, and a fourth mounting bracket assembly, said third mounting bracket assembly configured to couple said shell lower portion to the first support post, said fourth mounting bracket assembly configured to couple the shell upper portion to the second support post.

35. A back assembly in accordance with claim 34 wherein said lateral member is configured for single-handed release of said shell member from the wheelchair support posts.

36. A back assembly in accordance with claim 34 wherein said lateral member is slidably coupled to said coupling assembly.

37. A back assembly in accordance with claim 34 wherein said lateral member is coupled to said coupling assembly through a tongue and groove coupling arrangement.

38. A back assembly in accordance with claim 34 wherein said lateral member is coupled to said coupling assembly through an interlocking coupling arrangement.

39. A back assembly in accordance with claim 34 wherein said third and fourth mounting bracket assemblies are configured to pivotally couple said shell member to the support posts.

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